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PRODUCT DESIGN FOR ELDERLY−VISUAL DESIGN INFORMATION INSPIRED A NEW PERSPECTIVE IN DESIGN EDUCATION

Lau Langeveld
Fac. of Industrial Design Engineering
Delft University of Technology
l.h.langeveld@tudelft.nl

ABSTRACT

A workshop Product Design for Elderly was held in Beijing and organized by the School of Digital Media and Design, Beijing University of Posts and Telecommunications. A domestic appliances company had sponsored a part of the workshop and brought in the topics. The objectives of the workshop were creating a product design by each design team. and gaining design competence with use of visual design information. The work method was based on the sequential design process of Pahl and Beitz. The archetype of process design process was the building stone for the proposed product design for elderly process, which had a sequential character and feedback options. During the workshop were held three questionnaires for observation and experience research with a new perspective in design education. Communication and taking design decisions are the two design activities that run through the entire process. The go decision appeared to be crucial, so it could be defined as a separate design step. Visual information will be gathered among other things with a digital camera by taking pictures and making movies. This is "walking design". The idea generation is based on the gathered visual design information, the problem definition, the design brief and design space that defines the boundaries of the design solution. The concept development can be well presented in a visual way. Cost estimation is also included in the proposed process.

KEYWORDS

Elderly capability, design process, design method, product design, visual design information

1. INTRODUCTION

The workshop Product Design for Elderly was held in Beijing, China, from Monday 15th of July and ended Saturday 3rd of August with a public presentation about the product designs . The initiator of the workshop proposed to achieve financial support by a company. The biggest Chinese white good company made this workshop possible. The organization of the workshop was carried out by Beijing University of Posts and Telecommunications, the school of Digital Media and Design, section Industrial Design. The organizers invited me to be supervisor of the workshop, which implied leading the workshop during the three weeks and support the workshop participants with design information that was needed to bring the workshop to a successful end.

The workshop participants came from different universities of Beijing. Their background ran from mechanical engineering to art. One remarkable fact was, that most participants were female. The teams were formed by themselves, and chose the team leader who did most of the communication with the supervisors and the company. Eight product design teams were formed, consisting of four or five members. Four groups had a fifth member who had the job to do the daily organization or to provide assistance during the workshop with the visual record by making photographs and movies. Product Design for Elderly People [1,2,] was a broad design domain and the company liked to use the results for further development. In collaboration with the company, four topics were defined that covered the domestic appliances of their product lines. See table 1 for the defined topics.

The following working method was adapted from the Pahl and Beitz design process [3]. The steps are common as: Design task, Orientation Visual information gathering, Problem definition, Design brief, Idea generation, Concept development, Concept decision, Embodiment design and Detailed design. The company had spoken out their preference for a concept that could be deeply developed instead of detailed product design that was designed superficially. There were several moments that the teams had communication with the company by phone or by email [4].

The results of the workshop were presented in a design report and/or an oral presentation mostly

Table1 Topics for the workshop: Product Design for Elderly People.

theme : **Independency of aging people**		
Domestic Appliances	White good	Domestic appliances that relieve labour intensity as air conditioners, refrigerators, washing machines, etc.
	Kitchen appliances	Kitchen appliances for use in the kitchen as range hoods, gas cookers, electromagnetic ovens, microwaves, etc.
	Living room appliances	Domestic products, including lamps and lanterns, sanitary appliances, etc.
	Entertainment appliances	Domestic appliances use like TV's, radios, computers, mobile devices, etc.

guided with PowerPoint. Three questionnaires were held, each time about the experience of the workshop with specific questions about quantitative and qualitative aspects of the workshop. The outcome was remarkable, the gain achieved in this workshop wasn't only eight product design concepts, but also the development of individual designer identity.

The lectures during the workshop did support and inspired the students, so that they could create a product design in an enthusiastic mood. The created product designs fulfilled the expectation of the company. The speakers were invited by the organiser for inspiring design information, that the teams could use in their product design. The content of the lectures fitted perfectly in the workshop, it covered: a) new media and mobile communication [5,6], b) the fact that elderly had more capability than people hold for possible [7, 8], c) experience with elderly research [9,10,11,12,13,14] and d) universal design [15,16,17].

Three questionnaires were formulated to get insight in the design process the teams followed. These gave quantitative and qualitative information about the lectures presented during the workshop. The workshop participants had the challenge to express their experiences and learned aspects.

2. OBJECTIVES

The The workshop Product Design for Elderly was organized in the summer holiday of the universities of Beijing for an extra design experience of the students. During the workshop attention was paid to Product design, Design process, Decision making, Walking design (a new method for gathering visual information), Disassembly of existing products and Design information for motivating students to create innovative product design. Sound walking in common method used in product sound design [18]. The design process of Pahl and Beitz was adopted. The need question was left, because the work method did not offer the space to treat the need. The company was mainly interested in product designs that have opportunities for the medium term. The product design teams were allowed to use the design process that fits best.

Gathering elderly design information could be hard, but showing respect and patience could be the crowbar for reticence of elderly. If the needed design information was elicited under pressure then the received information had not the required reliability. One should become aware that the elderly themselves were silent. If you gave confidence to these elderly there could be a pleasant information exchange. Declared the reason and purpose of a visit. The treatment of written and visual information would be discussed in advance with the elderly. The discussion could only evoke openness and trust so that no information should withheld by the elderly during the visit.

The topics were chosen in such a way that the teams could create successful a product design which the company developed into a product. The workshop would be considered successful if more than three product design concepts had quality enough for further development. Within the three weeks workshop it could happen that a team came to a successful product design and the other only to some ideas with relative low quality design content. The topics were simply chosen from the daily life, so that

teams could empathize with the situation of elderly. The physical and mental capability of older people decreased with age. Aging meant that the performance of people declined, but obviously it would be happen different for all elderly.

Visual information gathering was used [19, 20, 21], because one picture tells more than a thousand words [22]. A movie tells more than a thousand pictures. This information is dynamically established, therefore the product design proposal was researched during the orientation phase of the design process. With three questionnaires about the workshop process, experience, support, and knowledge, the product designs will be explained in depth. The success of a product design depends on the deepness achieved during the design process.

3. GOALS

The teams, formed out of the thirty two workshop participants, had to deliver eight product designs. The product designs should have a quality level that is acceptable for the company. The quality of the product designs must fit in the content of the workshop, and cover at least one of the topics. Two product designs should be designed, at least in such a depth that it can be developed into a product. A sufficient depth of product designs can only be achieved if the design teams communicate the design matters of their product quiet well. Teams were formed on the basis of need, but each design required an appropriate approach with related disciplines, this can lead to different design teams. If enough disciplines are represented in each design team, then a good industrial product design will be created.

The workshop lasted only three weeks. The design process should be effective in this period for the design teams. This could only be done through the adoption of the Pahl and Beitz design process as a basis for developing their own design process that process could be completed in an effective manner. This design process should be created as an effective product design process and should have sequential steps with some overlap and a feedback opportunity. If a go decision had to be taken while the deepness of the product design is not sufficient then go back to the design step where the deficit occur. From the eight design reports would be proposed the design process for aging people that offers the new perspective for education.

4. WORK METHOD

In the workshop schedule one could recognize the adapted design process of Pahl and Beitz,. The schedule of the first week offered the orientation and analysis phase of the design process with a number of lectures for supporting, motivating and designing such as: Design process, New media, Walking design, Research methods on aged users, Decision making, and Disassembling and assembling [23, 24, 25]. The visual design information could be gathered during the interview and a visit to Beijing Sun City, an apartment complex for the aged. The schedule of the second week hold in the synthesis phase of the design process with two lectures about embodiment design and physical modelling. In this week the teams had to design very hard on the concept development and embodiment design. The schedule of the third week was planned for prototyping and evaluation with a public presentation on Saturday.

The eight assignments of the workshop had the same starting-point, within the four given topics. Within the topics, white goods, kitchen appliances, living room appliances and entertainment appliances, the design team had to choose a subject out of the topics. The information gathering could be done by focusing on the chosen topic effectively. Elderly or aging people were not distinguished by age but by physical and mental capabilities. This meant that the formulating of the assignment should carry some definition of these capabilities.

4.1. Design process

Many design processes were explained for all kinds of design problems in the design process lecture. A design process has an input and an output. This would be known as the archetype of product design (see figure 2) [25,26,27]. The definition of archetype was as followed according to Merriam Webster dictionary "the original model or pattern of which all things of the same kind were copied or based on". An addition to the archetypes may be, that the design process can be dynamically filled in. It constituted a significant contribution to the design process, that depended on its input [28].

Figure 1 Archetype of the product design process

The process should consist of an analysis and a synthesis. The input could be a design problem or an assignment and a product design was the output. If the design problem was not clearly defined then you got rubbish as input. It meant, that the output would also be rubbish. If the analysis was not carried out deeply, then the synthesis will keep up the same shallowness or even worse. The adopted design process of Pahl and Beitz, was perceived as effective but far from ideal. The design process "Product Design for Elderly" could be an effective sequential design process after investigation and preparation of the workshop.

4.2. Information gathering

Design information could be gathered on every step of the design process and generated at every design activity. The information sources were the usual ones as: internet, library, existed products, companies and users. Each source required its own method for example an existing product design had all the information stored in its appearance and performance. Disassembly and assembly method manifested how the designer manipulated with design information to come to a product design [29]. The information of a product could consist of the features that were experienced by the user, such as: design, social, cultural, economic, emotional, audio and visual. The methods of gathering design information used in the orientation phase of this workshop were interviewing, photographing and making of a movie, searching on internet. First of all the information gathering [30] should be done in effective. In the figure 2 below showed a model for gathering design information, that was adapted from Bruce [31] for developing library information gathering skills.

4.3. Communication

The elderly had no problems communicating with designers, if they knew that the information was handled fairly [32, 33] In any case each country had its cultural background so you had to get in touch with the elderly first. The elderly were previously asked for an interview. The design teams had to prepare the interview independently. The interviews were culturally dependent. The interview results were affected by the interviewer, the interviewees, the cultural aspects of business and the community. Arrangements with the elderly were made in advance, as individual arrangements would be difficult to make during the workshop, because of the unfamiliarity of the design problem and the timing for the interview.

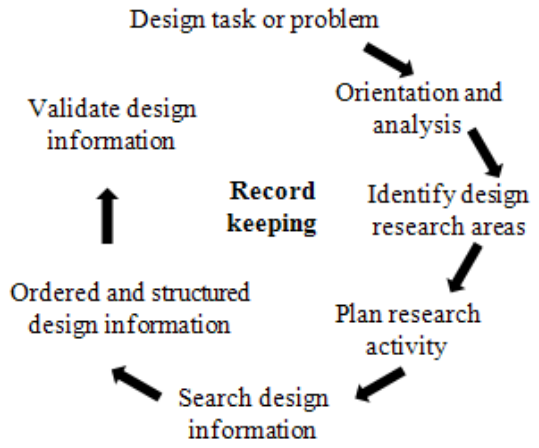

Figure 2 A model for design information gathering

The design brief should be the critical part of the design process. It helped developing trust and understanding between the interviewee and interviewer, but also between client and designer and served as an essential point of reference for both parties. Besides, the design brief ensured that important design issues were considered and questioned before the design work started. Here, a strong emphasis on communicating of the design process with all stakeholders was really essential. The communication with the stakeholders should be clear about How, What, When, and Where. This could be understood from a communication model [4] which was used for projects in design education (see figure 3) such as the workshop. However, the projects were carried out by students in a product design team. The projects were presented to companies and supervised by design teachers.

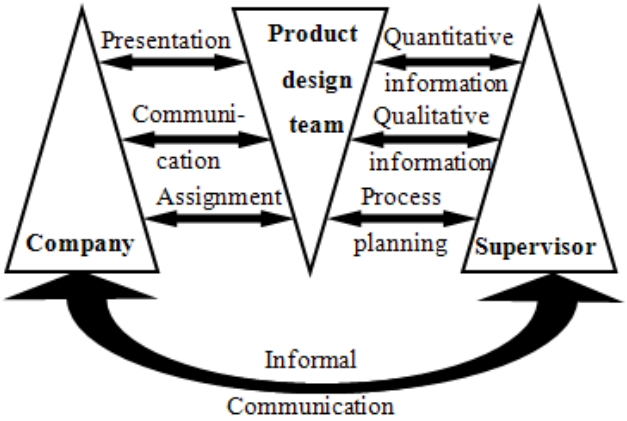

Figure 3 A communication model for design education projects in cooperation with companies

4.4. Design Brief

The design brief would be the step in the design process that answers the question; “How should this product be designed?” The same information should be used, but the question “How ?” would give the boundaries within the design activities had to take place. The design brief should be written effectively without any doubts about the interpretation of the written text. Much information about writing a design brief was given by the design associations with some examples. A thorough and an articulated design brief would be the critical part of the design process.

4.5. Design solution

The idea generation could start after the design brief. For a good design process the idea generation should take place within the boundaries of the problem definition and the design brief. The generated ideas led to design solutions, which could be irrelevant, conservative, innovative or a mixture of these (see figure 4). Spend no design time on the irrelevant design solutions. Conservative design solutions should have some market potential for just a year. These were small modifications of an existing product that required a lot of concentration of the research and development department. Marketing should be able to identify accurately the market, where small changes took place over a very short period. But the design benefit required mixed design solutions and innovative design solutions.

4.6. Decision making

The decisions could be taken on the basis of the available design information. The results of the decisions brought each time the design a step closer to the problem solution. The question: "Why this product should be designed?". This should be answered by yes or no.

The most promising product idea could be found out of the generated product ideas which must be ordered and structured as design solutions. Here should be decided, which ideas could be developed further.

Due to time constraints not all the generated ideas could be developed into a product concept. Decisions were made on the basis of the design decisions matrix that was especially developed for product design and detailed design, see table 2 next page [29]. To create an innovative product design in an effective way, many decisions should be taken during the different design stages such as: idea generation, concept development, embodiment design, detailed design and prototyping. This occurred at various levels, whose draft would differ significantly.

4.8. Creative methods

In the Delft Design Guide [34], many creative methods were described that should be suitable for generating innovative ideas. The following methods were in the guide declared: Creative techniques, Mind maps, How to’s, Brainstorm method, Synectics, Function analysis, Morphological chart, Use Scenario’s, Written story, Story board and Roleplaying, Checklist concept development, Design sketches and Three dimensional Models in concept generation. At least one of the creative methods could be used to generate innovative product ideas. All the ideas that could be generated, were placed in

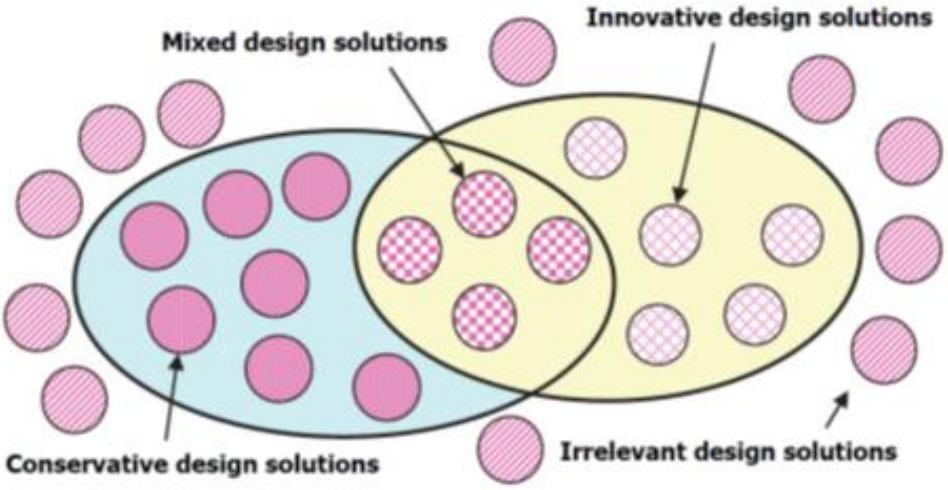

Figure 4 Possible design solutions

the design solutions space. Let generate quick and dirty about 30% to 50 % of the design solutions. However generating more design solutions took too much time. The quality of these design solutions could decrease by further design exploration.

4.7 Questionnaire

Three questionnaires were formulated and mailed to the workshop participants at the end of each week. The participants were able to complete this digital survey on a voluntary basis. The questions were designed to gauge the experiences of the participants of the workshop and the content and quality of the lectures. There were also open questions where opinions, needs and questions could be about the workshop asked. In this way, product teams could be followed in the progress in the design process, but the observations of the supervisors also gave insight into the design process. It gives quantitative and qualitative design information about the workshop that an appropriate design process could be created. The workshop participants had the challenge to express their experiences and learned aspects.

5. VISUAL INFORMATION GATHERING

By taking photographs, the design information could be established on a visual manner, that was structured based on the workshop topics and the experience of elderly people (see figure 5). This belong to walking design. The behaviour of elderly

Table2 The design decisions matrix for product and part design

Design Decision	Product Design	Part design
Decision making (Who)	Who decide which function could be fulfilled by product design? How might the product design be subdivided (but still a whole remains)?	By whom is the component or part being designed? What are the critical characteristics of part design to take into account?
Objectives (Why)	What are the goals and the performance objectives?	What are your goals and the performance objectives, concerning components and parts? How complex are the relation between objectives of the part?
Content (What)	What knowledge and skill areas need to be "covered"? What aspects of these topics are in the scope and out the scope important?	What information, procedures, skills, models, etc. will be shared with team members? What is in the scope and out the scope for the parts?
Delivery Method (Where)	Which will be the best delivery methods to accommodate the needed techniques, the overall preferences? What are unit's interfaces?	How are you going to deliver the part? What tools will be used to develop the part?
Techniques and Activities (How)	Which technique supports the best promotion of the product design?	What techniques will best contribute to the achievement of objectives? What is a high level for part design?
Structure and Timing (When)	Which aspects of the product design need to be self-directive (pulled) vs. need to be instructed (pushed How do you organize the research and design aspects of the product design? What is the intended time planning of the product design?	How do we organize the parts design on time? How products are broken down in parts? How do we represent the content (graphics, sound)? How long will it take to complete individual activities or components? What is the intended design time of individual parts?

people depends strongly on the physical and the mental capabilities. It is almost impossible to realize for all elderly people a vitality description with the corresponding motivation. Actually, this gathered information should be stored in a database for elderly data.

Figure 5 Part of the gathered design information of a workshop project dedicated to the problems.

The design teams of the workshop made effective use of visual design information registration by using a digital camera. The use of a movie camera has not been considered out of the piety for the residents of the visited elderly home. By staying close to the topics of the workshop the topic entertainment should be explored , which delivered a great number of interactions. Just the interaction between a human being and the machine gave visual design information about the design problems.

The graduation projects of Medesign(design with medical backgrounds , the graduation variant of Industrial Design Engineering, Delft University of Technology, made use of visual information during the orientation stage of the projects. The results were edited in the book "Products for healthcare, medesign graduations projects" [35]. A chapter of the book was dedicated to design for elderly care, which 14 graduation projects summaries contained. The visual information should be documented to fill a database with these information that could be shared with colleagues . However the database had to be maintained so that the information stayed up to date. The used and unused visual information had so much value that the database for design for elderly should be created very soon.

6. IDEA GENERATION

The idea generation started after problem definition and the design brief. Perhaps writing a vision on the product design could help determining the boundaries of the design space. The vision was developed from the orientation phase for the problem definition and the design task, but also gathered design information on the design were taken, both written and visual information. It was an opportunity to define a vision, that gave at least one extra criterion in the form of a definition of the design space boundary.

The design teams were free to choose the creative technique to come to ideas. The most used techniques were sketching and mapping. Sketching was obvious due the fact that the Chinese people

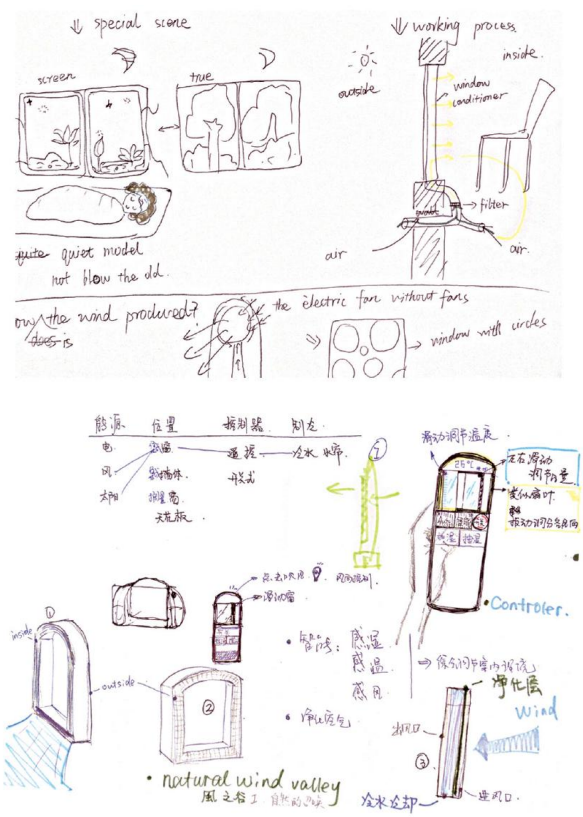

Figure 6 Sample of idea generation with primitive sketching and writing with Chinese characters.

were image thinkers and not, like western people, abstract thinkers. Image thinking was taught from an early age; they learn to express themselves in Chinese characters which are actually images.

The result of idea generation delivered a great number of product ideas on different design solution types and levels. In figure 6, samples of idea generation were shown about fresh air and clean air as an example. The design team Long Life Noodles based the product ideas on their vision of the valley of the winds. The inspiration came from the movie "Nausicaä of the Valley of the Wind" of director Hayao Miyazaki [36]. However, the air in the city Beijing was really polluted, heavy rain and strong winds were the factors that freshen the air, however the air quality is also highly dependent on the temperature. For fresh air , conditioned air and clean air products were available on the market, but a climatological approach should deliver air that was good for a healthy and comfortable life. The air required special research by specialist from different disciplines, which was needed for a healthy lifestyle. The design team could base their ideas on air with the parameters: speed and flow, temperature, humidity and number of particles of pollution elements. The parameters should be defined by calculations and measured afterwards for evaluation the product design.

7. CONCEPT DEVELOPMENT

Ideas had to be develop into concepts, in which the working principle was established and costs estimated. Costs were not addressed during the workshop, because simply no knowledge of costs was present. Product knowledge was rapidly deteriorating in the universities, there was more appreciation for academic writing about products.

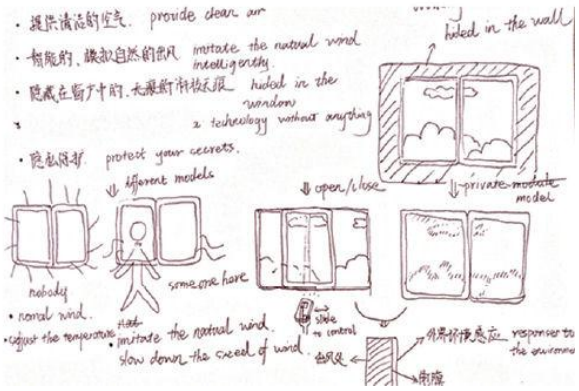

Figure 7 A concept of the calling Nature

The performance of products was not only the design but the interrelationships should be understood in detail. The working principle was designed to a stage of possible solution(s). In figure 7 was shown the concept of an air system with the basic principles out the generated ideas.

The visual presentation by means of images gives more content than only the pictures. The content has metaphysical properties locked in it which were transformed into physical property. This transformation mainly take place at the embodiment design stage, just after the concept decision making.

8. EMBODIMENT

During the design phase, the chosen concept would be further developed until the details had to be fixed about: material, geometry, tolerances, surface quality and assembly conditions. In figure 8 was showed the embodied invisible water-heater shower system for the Chinese market. For this, the design teams had not made a cost estimation because the company was only interested in well-developed product ideas. In the case of the invisible water-heater, the company was interested in the thinness or slimness of the system. In the new apartment buildings, the systems could be installed in an invisible way. Installation in existing situations required a lot of effort and cost because the space should to be made in the wall. The assembly could not be done otherwise than on the

Figure 8 The embodied invisible water-heater for a shower system in China

wall, when the slenderness of the heater came in favor of the bathroom decor. A new way of showering could be introduced just for elderly with all kinds of support devices, such as: shower chair, grips, back support, etc. This product design would be further develop by the company. Embodiment design was a process where the physical, economic and metaphysical properties could be further developed before a go or no-go decision was taken. After this decision, the design process had to deal with the detailed design.

9. RESULTS FROM THE WORKSHOP

The results of the workshop were considered from the questionnaires and vision of the three stakeholders: workshop, participants and company. The three weeks workshop was a benefit for all the stakeholders, workshop supervisors, company and the participants. The results would be presented in separate subchapters so the results were attributed to the correct owner from the questionnaires and experience of the workshop from the perspective of the three stakeholders.

9.1. Questionnaires

The three questionnaires were filled in on a voluntary base. The workshop took three weeks, but a questionnaire were formulated for an one week period. The first survey, the response of the participants were twenty four. The second questionnaire, the response were as much as twenty five. The third and final questionnaire there were a response of 9 participants only. The participants were divided into eight groups of which 58% were female and the remaining 42% were male. The females were supernumerary, so some teams had a feminine team leader. The workshop participants came from five universities in Beijing, Beijing University of Posts and Telecommunications with the bulk of 60% of participants who were spread across various faculties, University of Science and Technology Beijing with 20% of participants, most of whom have an engineering background. China Women University participated with 12% of participants in the workshop, but they had an art and fashion background, Beihang University came up with only 4% of the participants or one participant who had a astronautic and aeronautical background, but also Beijing Technology Business University came with one participant who had engineering and business background.

In the first week, most presentations were experienced as very good, only one presentation was of lower quality. Here, a focused mission for the presentation should have a better effect, so that all problems were solved. The supporting design information was adequate but occasionally some abnormalities occurred. Disassembly was a surprising experience for the workshop participants, in which they had learned that visual design information could be captured. The practical application of disassembly provided an experience that could not be provided by theory lectures.

The second week was experienced positively as well. However, it appeared to be necessary to develop a method for better communication between participants and supervisors. The communication with the company about opinions varied from pleasant to unpleasant. Communication with the company had greatly influenced by the design work. However, some teams used the communication for additional input for their design considerations. In these cases, the influence on the design work was less. Finishing the digital version of the concepts was a real challenge because they ran into a time limit. Time pressure should be avoided by taking decisions on time. This eternal problem was also experienced here, while the design progress was experienced as slightly annoying by time constraints in the design process. Unfortunately, the problem definition and the design brief were not easily perceived as steps in the design process. The proper use of creative methods required some training, but eventually decisions were taken, that should be included in the design.

The third week was hectic because the teams had to deliver an informed product design and justify it in a design report. Suddenly, the documentation appeared to be very important for the reporting and public presentation. Actually, every day the resulting output of the design process and the distribution of tasks for the next design day provide a structured documentation, which could be used for miscellaneous purposes. The experience was different, namely the documentation also had to be done just. The teams learned much because they had to apply another design approach than they were used to. Namely, the materials must be carefully chosen, a good design was necessary and it must be able to be manufactured. The questionnaire showed that walking design was appreciated best, but on the other hand, the design brief and the modelling were poorly appreciated. But these design aspects should

definitely be included in a proposal for a new design process: product design for the elderly. The conclusion may be drawn that the participants learned many aspects of the design. The company would develop four of the product designs. BUPT will develop the product concepts further, in collaboration with the company. From the eight product designs, four were not deeply enough designed and documented. However, still companies were interested in these designs.

9.2. Results for the company

The workshop brought the company eight product designs with different level of design deepness. They had also experienced the communication between them and the workshop participants. The time constraints of the company put really pressure on the projects, because optimisation of the product designs would give a good benefit for the company. The company had learned that product design was not only idea generation and concept development but also embodiment design with the engineering aspects. The immaterial benefit could be greater than the products design. The gain of design experience from another point of view could open new perspective for them.

9.3. Workshop participants results

Knowledge about the design process was gained with a special view of innovation, what could be used for their product. The participants could develop their own design process and contribute in their project teams the best of their skill. The communication with the company was freighted for them because they got direct a judgment on their product idea and the design. All the projects team had presented their product design, but the results was dependent on the communication in the team and with the supervisors. The individual participants gained big steps in the design competence, but also on their design identity. The conclusion could be design experience counted only by communication with company and supervisors.

9.4. Workshop supervisors and owner results

The workshop was finished with a public presentation of all the project teams. Finally the best projects were selected by a jury. The four best product would be develop further in cooperation the company. The results and experience may be used for follow up of the workshop Product Design for Elderly

10. PRODUCT DESIGN FOR ELDERLY

Product design for elderly had two main objectives, namely 1) to support and entertain elderly people with products, that overcame their physical and mental decline, and 2) maintaining the proper body condition without forgetting the spirit. This process opened with the visual gathering new perspective for product design for elderly in education. In design education you feel the need to exercise the explicit process steps but it could also consist of implicit sub process steps that needed to be practiced separately. For instance embodiment design included the concept design until the detailed design at the Pahl and Beitz design process. However embodiment design could offer more perspective by specific training in steps as feasibility, FMGP method [37] and cost estimation [38, 39], it could be found in the proposed design method for Product Design for Elderly. The method was developed after the workshop out the experience of the supervisors and the participants. The development starts with the archetype in sub chapter 4.1. Two block types are mainly used in the model (see figure 9 and 10)

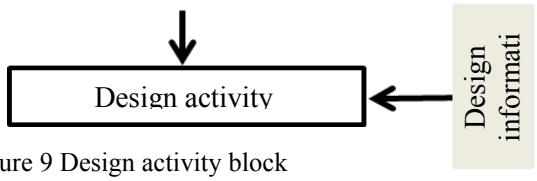

Figure 9 Design activity block

The design activity block had design information from the process as input but also the already generated and gathered design information. All the validated design information needed to act that got manipulated and served as output from this design activity. This design output served as input in the next design activity.

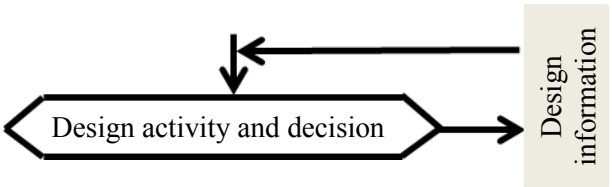

Figure 10 Design activity and decision block

A design activity and decision block should the design activity carried out and decisions made. The decisions results were added as design information. If

the decision needed a feedback than the possibility was created. At many iteration steps one after the other had to take place, then should the decision criteria adjusted.

The needs of the elderly were twofold: supportive meant to compensate for the physical deterioration and pleasant activities for the entertainment aspects. Orientation, design research and visual information gathering were the design process steps which must be taken before the needs of the elderly could be determined for the objectives for which the design will be made. The visual information gathering and the needs design steps belong to the walking design. Walking design was a process in which the visual information gathering could be associated to the interpretation of that information. During a walk with a digital camera in your hand, the observations

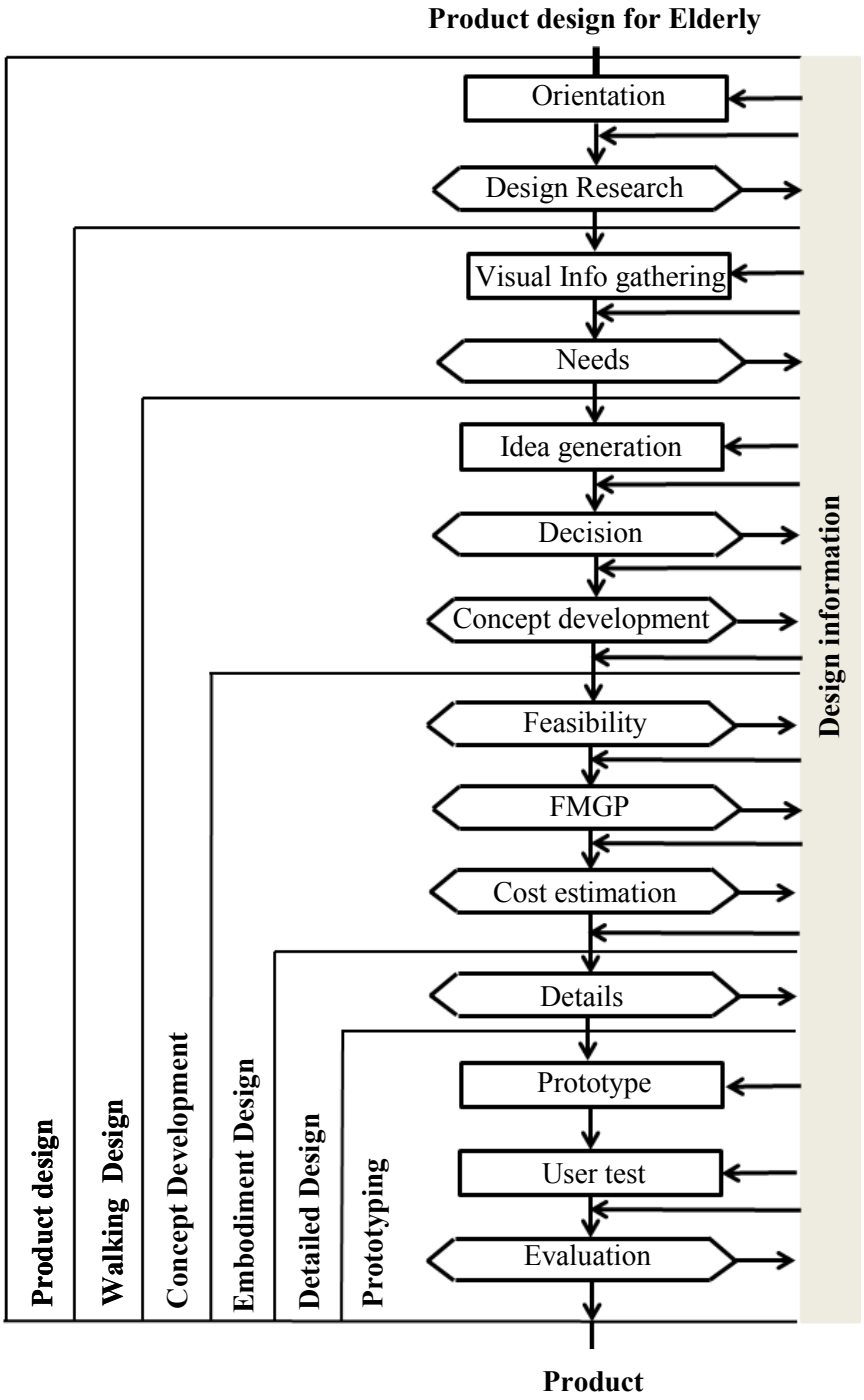

Figure 9 Proposed Model for Product Design for Elderly

of your senses had to register and the brains were activated with ideas and associations of the perception. Thus, the observation of a design problem could be talked about during walking design. In the proposed product design for elderly (see figure 9), walking design was the new design element. Walking design was introduced as a new part of the product design process. The visual information could be easily obtained by observation and interviews, especially for the elderly who were often secretive. The student design teams experienced walking design as very positive. A reason for this experience could be image thinking that the Chinese students got from birth through the language consisting of Chinese characters (images). The other steps were known for their stage of design. Only embodiment design had an cost estimation step that gave an extra step in the design process to fill in the gap on cost awareness of students, but professionals had the same problem. Cost estimation is a necessity, but could never replace it. However, a good cost calculation could only be made after the product was made.This proposed design process should be researched further on the following points: visual information gathering, walking design, cost estimation , decision of the ideas and the FMGP method. The design research had to be focused on elderly who saw decrease their physical and mental capabilities.

11. DISCUSSION AND CONCLUSION

The workshop had brought much for all stakeholders. The students all experienced their personal learning points, such as: structure, communication, planning the design process, working in a team, documentation and design. This was actually much to mention, but the questionnaires confirmed it. But the learning points could be even better if the communication between the design teams was entirely in English. An articulated vision resulted in a product that could led to the most in-depth product design. This vision provided an additional input to the research needs of the elderly. The needs for the elderly should be investigated for supporting a way of life, but also for entertainment lifestyle. These lifestyles required a research approach, which essentially could be distinguished from each other. Both approaches have a completely different meaning and strategy: the enlightening and supported product designs with the market demands and stimulating and entertaining product designs that were created and edited for the market. Product design for the elderly was on the one hand to relieve the physical effort. On the other hand, it is to stimulate the joy of life.

Finally, the workshop was a great success with eight product designs for elderly. Embodiment design had three defined steps: feasibility, FMGP and cost estimation as a new perspective for product design for elderly in education.

All design activities had contributed to the proposed product design for the elderly. Walking design was experienced as a good method to formulate the needs of the elderly. It should be noted that the design space was determined by the physical and mental capabilities of elderly

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